Remarks

Upon entry of the foregoing amendment, claims 1-12 and 15-17 are pending in the application, with claims 1, 10, 12, and 15 being the independent claims. Claims 1-4, 6-8, 10, 12, 15, and 17 are sought to be amended and claims 13-14 are sought to be canceled. These changes are believed to introduce no new matter, and their entry is respectfully requested. Various amendments were made to the specification, drawings, and abstract to correct minor informalities. Some of these amendments were made to address the Examiner's objections to the drawings and various rejections of the claims, as discussed below. These changes are believed to introduce no new matter, and their entry is respectfully requested. Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Objections to the Drawings

Figure 3C was objected to for not including vias 375a, 375b, and 375c, and blocking strips 376 and 377. This figure has been amended to correct the informalities.

Objections to the Claims

Claims 10-12, 15, and 16 have been objected to due to various informalities. These informalities and other similar informalities have been addressed in the foregoing claim amendments. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Rejections under 35 U.S.C. § 112

The Examiner rejected claims 8, 10, 11, and 14-16 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claims 8 and 10 have been amended to remove the "precision" recitation from the claims, rendering this rejection moot. However, the "precision substrate" is described in paragraphs 42 and 43 of the originally filed specification, and Applicants assert that this description is sufficiently definite for purposes of 35 U.S.C. § 112, second paragraph.

Claim 13-14 were deleted rendering this rejection moot.

Claim 15 was amended to clarify the "variable gain amplifier" as "a first variable gain amplifier" and "a second variable gain amplifier" so as to provide proper antecedent basis.

Based on the above amendments and remarks, Applicants respectfully request that the rejections under 35 U.S.C. § 112 be reconsidered and withdrawn.

Rejections under 35 U.S.C. § 102 and 103

The Examiner rejected claims 1, 13, and 14 under 35 U.S.C. § 102(b). Specifically, claims 1 and 13 were rejected as being anticipated by U.S. Patent No. 4,423,396 to Makimoto *et al.* (hereinafter, "Makimoto"), and claims 13 and 14 were rejected as being anticipated by U.S. Patent No. 5,192,926 to Sogo *et al.* (hereinafter, "Sogo"). Additionally, claims 10 and 12 were rejected as being obvious over Makimoto and Shen (U.S. Pat No. 6,108, 569), respectively. Claim 15 was rejected as being obvious over Domino (U.S. Pat No. 6,259,752) and Chan (U.S. Pat. No. 6,191,665), in view of Makimoto. Applicants respectfully disagree and traverse these rejections based on the remarks below.

Claim 1 was amended so that the resonators are spiral resonators. Furthermore, the bypass line input is formed from an outer segment of the first spiral resonator that is arranged in-parallel with a first portion of the bypass line, and the bypass line output is formed from an outer segment of the second spiral resonator that is arranged in-parallel with a second portion of the bypass line.

With regard to claim 1, Makimoto does not teach spiral resonators and therefore does not anticipate claim 1. Furthermore, even through Krause (U.S. Patent 4,757,285) and Shen (U.S. Patent 6,108,569) teach spiral resonators, none of the cited references (or their combination) teaches or suggests the *bypass line input* or the *bypass line output* described in claim 1. Accordingly, claim 1 is not anticipated by Makimoto, Krause, or Shen. Furthermore, claim 1 is also not obvious in view of the cited references because the combination does not teach each and every feature of the claimed invention.

Claim 10 recites a bandpass filter having the bypass line, the bypass input coupler, and the bypass output coupler, similar to claim 1. Furthermore, the bypass line is further recited to cause improved image rejection. Accordingly, claim 10 is also allowable over the cited references for the same reasons discussed above.

Claim 12 recites a differential bandpass filter having bypass line, the bypass input coupler, and the bypass output coupler, similar to claim 1. Furthermore, claim 12 has been amended to recite that the first and second inputs form a differential input capable of receiving a differential signal, and the first and second outputs form a differential output capable of producing a differential signal. Furthermore, FIG. 8a of Shen does not illustrate a differential input since the spirals 83 and 83a have a common feed 87 that would be incapable of carrying a differential signal because the positive component would be shorted to the negative component. Accordingly, the cited references including Shen does not teach or suggest each and every feature of the claimed invention, and therefore does not anticipate or render claim 12 obvious.

Claim 15 recites a double conversion tuner having the bypass line input similar to that discussed above. Accordingly, claim 15 is allowable over the cited references for the same reasons discussed above.

Based on the discussion above, Applicants assert that independent claims 1, 10, 12, and 15 and their respective dependent claims are allowable over the cited references, and therefore request that the rejections be removed and that these claims be passed to allowance.

Other Matters

U.S. Patent No. 6,438,394 B1 to Zhang was cited in the Office Action but was not listed on the included PTO-892 form.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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Version with markings to show changes made

In the Specification:

Please amend the following paragraphs/sections as follows.

Amend paragraph 27 as follows:

The ground 226 is located beneath the bandpass filter 200[,]. [the] The printed metal traces comprising the input capacitor 204, first resonator 206, first intercoupler 210, second resonator 214, second intercoupler 216, third resonator 220, output capacitor 222, bypass line input coupler 208, bypass line output coupler 218, and bypass line 212 are microstrip transmission lines. Other equivalent transmission lines could be used. In one embodiment, the input capacitor 204 and the output capacitor 222 are printed finger capacitors. Printed finger capacitors are used to provide stronger capacitive coupling than is possible with transmission lines. The finger capacitors are simpler and less expensive than discreet surface mount capacitors and can be used on a single layer printed circuit board. The finger capacitors provide the necessary coupling capacitance without increasing the cost or complexity of the bandpass filter 200. Capacitors, other than finger, could be utilized as would be understood by those skilled in the art.

Amend paragraph 39 as follows:

The physical characteristics, trace width, length, and spacing, of the bypass line 312, the input capacitor 304, the bypass line input coupler 308, the bypass line output coupler 318, the first intercoupler 310, the second intercoupler 316, and the output capacitor 322 are selected to cause the bypass line signal 230 to be approximately equal in amplitude and opposite in phase to the image channel component of high IF signal 130. [In additional embodiments of the present invention, the bypass line signal]

Amend paragraph 59 as follows:

FIG. 6 illustrates the steps of a method for printed bandpass filter design 600. In step 610, the variable filter design parameters used in the design are selected. In step 620, printed bandpass filter performance is simulated. In step 640, if simulated printed bandpass filter performance is equal to the filter design goal performance, step 630 is performed. If printed bandpass filter simulated performance is different from filter design goal performance, step 650 is performed. In step 630, the filter design is complete. In step 650, the filter design parameters are incrementally varied in a manner to cause the simulated printed filter performance to approach the design goal performance. Steps 620, 630, and [640] 650 are repeated until the simulated filter performance is equal to the design goal performance.

In the Claims:

Please cancel claims 13-14 without prejudice or disclaimer.

Please amend the following claims as follows.

1. (Once Amended) A bandpass filter, comprising:

a plurality of spiral resonators that are electromagnetically coupled to each other, each spiral resonator having a terminal coupled to a ground;

a bypass line in parallel with said plurality of spiral resonators, said bypass line having a bypass line input coupled to a first spiral resonator of said plurality of resonators and a bypass line output coupled to a second spiral resonator of said plurality of resonators;

an input, coupled to said first spiral resonator; and

an output, coupled to said second spiral resonator[.];

said bypass line input formed from an outer segment of said first spiral resonator that is in-parallel with a first portion of said bypass line, said bypass line output

formed from an outer segment of said second spiral resonator that is arranged in-parallel with a second portion of said bypass line.

2. (Once Amended) The bandpass filter of claim 1, wherein said spiral resonators are quarter wavelength transmission lines.

3. (Once Amended) The bandpass filter of claim 2, wherein said quarter wavelength transmission lines are microstrip transmission lines[, said microstrip transmission lines printed in a spiral pattern].

4. (Once Amended) The bandpass filter of claim 1[3], further comprising:

an input capacitor coupled between said input and said first spiral resonator; and

an output capacitor coupled between said output and said second spiral resonator.

6. (Once Amended) The bandpass filter of claim 4, further comprising:

a bypass line input coupler, coupled between said bypass line and said first spiral resonator; and

a bypass line output coupler, coupled between said bypass line and said second spiral resonator.

7. (Once Amended) The bandpass filter of claim 6, wherein said plurality of spiral resonators includes a third spiral resonator coupled between said first spiral resonator and said second spiral resonator.

8. (Once Amended) The bandpass filter of claim 7, further comprising:

a [precision] substrate, wherein said plurality of spiral resonators, said bypass line, said input capacitor, said output capacitor, said bypass line input coupler, and said bypass line output coupler are printed on said [precision] substrate.

10. (Once Amended) A bandpass filter comprising:

an input coupled to an input capacitor;

an output coupled to an output capacitor;

a first spiral resonator coupled to a ground, said input capacitor, a first intercoupler and a bypass line input coupler;

a second spiral resonator coupled to said ground, a second intercoupler, a bypass line output coupler, and said output capacitor;

a third spiral resonator coupled to said ground, said first intercoupler, and said second intercoupler, wherein said first spiral resonator, said second spiral resonator and said third spiral resonator are electromagnetically coupled quarter wavelength transmission lines;

a bypass line coupled between said [input] bypass line input coupler and said [output] bypass line output coupler[;], wherein said bypass line [causing] causes improved image channel signal rejection at said output; and

a [precision] substrate, wherein said first spiral resonator, said second spiral resonator, said third spiral resonator, said bypass line, said input capacitor, said output capacitor, said bypass line input coupler, and said bypass line output coupler are printed on said [precision] substrate[.];

said bypass line input coupler formed from an outer segment of said first spiral resonator that is in-parallel with a first portion of said bypass line, said bypass line output coupler formed from an outer segment of said second spiral resonator that is arranged in-parallel with a second portion of said bypass line.

12. (Once Amended) A differential bandpass filter, comprising:

a plurality of spiral resonators that are electromagnetically coupled to each other, each spiral resonator having a terminal coupled to a ground;

a first bypass line[;], in parallel with said plurality of spiral resonators, said bypass line having a bypass line input coupled to a first spiral resonator and a bypass line output coupled to a second spiral resonator;

a first input, coupled to said first spiral resonator;

a first output, coupled to said second spiral resonator[.];

a second plurality of spiral resonators that are electromagnetically coupled to each other, each spiral resonator having a terminal coupled to said ground;

a second bypass line[;], in parallel with said second plurality of spiral resonators, said second bypass line having a second bypass line input coupled to a third spiral resonator and a second bypass line output coupled to a fourth spiral resonator;

a second input, coupled to said third spiral resonator; and

a second output coupled to said fourth spiral resonator[.];

said first bypass line input formed from an outer segment of said first spiral resonator that is in-parallel with a first portion of said bypass line, said bypass line output formed from an outer segment of said second spiral resonator that is arranged in-parallel with a second portion of said bypass line;

said second bypass line input formed from an outer segment of said ~~first~~ third spiral resonator that is in-parallel with a first portion of said bypass line, said bypass line output formed from an outer segment of said ~~second~~ fourth spiral resonator that is arranged in-parallel with a second portion of said bypass line; and

said first input and said second input forming a differential input capable of receiving a differential signal, said first output and said second output forming a differential output capable of producing a differential signal.

15. (Once Amended) A double conversion tuner, comprising:

a tuner input;

a first variable gain amplifier, coupled to said tuner input;

a first mixer coupled to a first local oscillator and said [low noise] first variable gain amplifier;

a printed bandpass filter, coupled between said first mixer and a second mixer, including[:]

a plurality of spiral resonators that are electromagnetically coupled to each other, each spiral resonator having a terminal coupled to a ground;

a bypass line[;], in parallel with said plurality of spiral resonators, said bypass line having a bypass line input coupled to a first spiral resonator and a bypass line output coupled to a second spiral resonator;

said bypass line input formed from an outer segment of said first spiral resonator that is in-parallel with a first portion of said bypass line, said bypass line output formed from an outer segment of said second spiral resonator that is arranged in-parallel with a second portion of said bypass line;

a bandpass filter input, coupled to an output of said first mixer; and

a bandpass filter output coupled to an input of said second mixer;

a second local oscillator, coupled to said second mixer;

a second IF bandpass filter coupled to said second mixer and a second variable gain amplifier; and

a tuner output, coupled to said second variable gain amplifier.

17. (Once Amended) The bandpass filter of claim 7, further comprising:

a first intercoupler that weakly couples said first spiral resonator to said third spiral resonator; and

a second intercoupler that weakly couples said third spiral resonator to said second spiral resonator.

In the Abstract:

Please amend the Abstract as follows:

PRINTED BANDPASS FILTER FOR A DOUBLE CONVERSION TUNER

ABSTRACT OF THE DISCLOSURE

A printed bandpass filter is mounted on a precision substrate to eliminate the need for post-fabrication tuning. The filter input is capacitively coupled to a series of quarter wavelength resonators and the filter output. The quarter wavelength resonators are printed as spirals to reduce filter size. The resonators define the bandpass characteristics of the filter. The filter also weakly couples the input signal to the filter output in a manner to cancel the signal image. Mechanical clips mitigate thermal stress on solder connections when the precision substrate is mounted on a second printed circuit board.